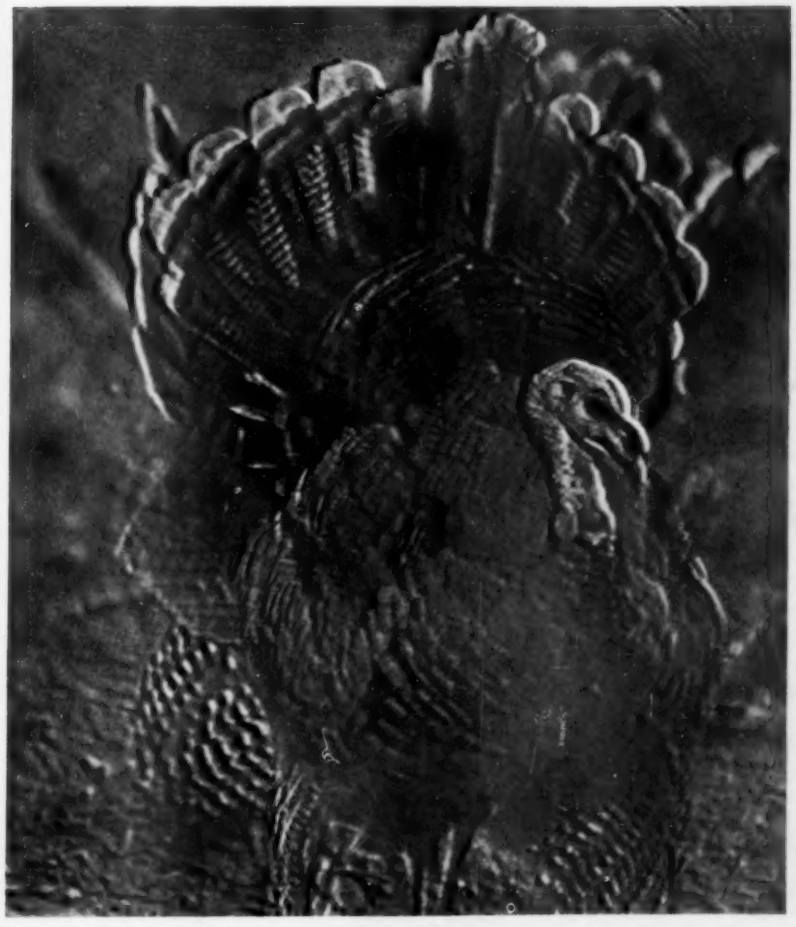
SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •



NOVEMBER 21, 1936

King of the Feast

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A SCIENCE SERVICE PUBLICATION

SCIENCE NEWS LETTER

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The Weekly Summary of

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Edited by WATSON DAVIS

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DO YOU KNOW?

Effects of hot and cold weather on dairy cattle have recently been investigated.

Ways of making shade trees increase their growth have been investigated at Cornell University.

From 500 to 600 metric tons of cod liver oil are consumed annually in Switzerland as stock feed.

The Argentine government may purchase six airplanes to serve in carrying doctors and medical supplies to remote regions.

Green tomatoes are found to have practically the same food value as ripe ones, if cooked as vegetables or pickled or preserved.

A French engineer has invented a power plant for operating boats and airplanes by centrifugal ejection of air or water, which he claims is 50 per cent more efficient than a propeller.

Mountain lions, once almost extinct, are staging a comeback, judging by reports of them in western mountains.

A Zeeland fisherman discovered the way to cure herring, in the fourteenth century, and these fish have been important in northern Europe's commerce ever since.

Scarlet flamingoes brought to Florida have begun to build nests and lay eggs, and it is hoped that eventually some young flamingoes will be hatched in the United States.

Podunk is a joke-town in vaudeville fame; but historic Podunk in Massachusetts was a place where Indians tortured captives, and Podunk means "place of burning."

Among Indian mounds in Wisconsin are a number shaped like the panther—Indian water spirit—and archaeologists wonder why these outlined animals were given earthen tails curving in various odd ways.

WITH THE SCIENCES THIS WEEK

Most articles are based on communications to Science Service or papers before meetings, but where published sources are used they are referred to in the article.

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PHYSICS-CHEMISTRY

Debye, Hess and Anderson Win Nobel Prize Laureates

Cosmic Radiation Research, Discovery of Positron, Findings on Electric Behavior of Liquids Honored

JOINT award of the 1936 Nobel physics prize just made to Dr. Carl D. Anderson of California Institute of Technology and to Prof. V. F. Hess of the University of Innsbruck, Austria, resulted from research on the penetrating cosmic radiation that still holds many mysteries.

Dr. Hess receives the prize for his discovery of cosmic radiation in 1912. Dr. Anderson, then only 27 years old, discovered the positron or positive electron in 1932, and thus wrote his name into the history of science as the first to recognize one of the fundamental particles out of which the universe is built. This discovery of the positron came while cosmic rays were being investigated.

Balloon ascensions made by Dr. Hess in 1911 showed that the mysterious and penetrating radiations that other scientists attributed to radioactive substances in rocks must originate outside the planet earth. Dr. Hess, who is still active in physics research, was thus a pioneer balloonist in quest of cosmic ray data. At first Dr. Hess suspected that the radiation originated in the sun, but that was later disproved.

Study of the powerful radiations was undertaken by many scientists in subsequent years. Among the leaders was Dr. Robert A. Millikan, whose researches brought them into prominence. Dr. Anderson collaborated with Dr. Millikan upon his researches and while watching tracks of radiation made in water vapor subjected to intense magnetic fields found the positron or positive electron which previous theory postulated must exist.

Chemistry Prize

The Nobel Prize in Chemistry for 1936 has been awarded to Prof. Peter Debye, director of the Kaiser Wilhelm Institute of Physics in Berlin and professor of physics at the University of Leipzig. Prof. Debye, who recently was in this country as a guest speaker at the Harvard Tercentenary celebration, is a co-founder of the famous Debye-Huckle theory in physical chemistry, which made it possible to calculate exactly the electrical conductivity of a strong electrolytic solution.

One of the most interesting applications of this theory to everyday things is the concept that the invisible inner structure of water resembles that of a solid like a diamond much more closely than it does a vapor like steam, in which molecules are all tumbled about without any right-side-up or upside-down.

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PHYSICAL CHEMISTRY

Prize Theory Concerns Electricity in Solutions

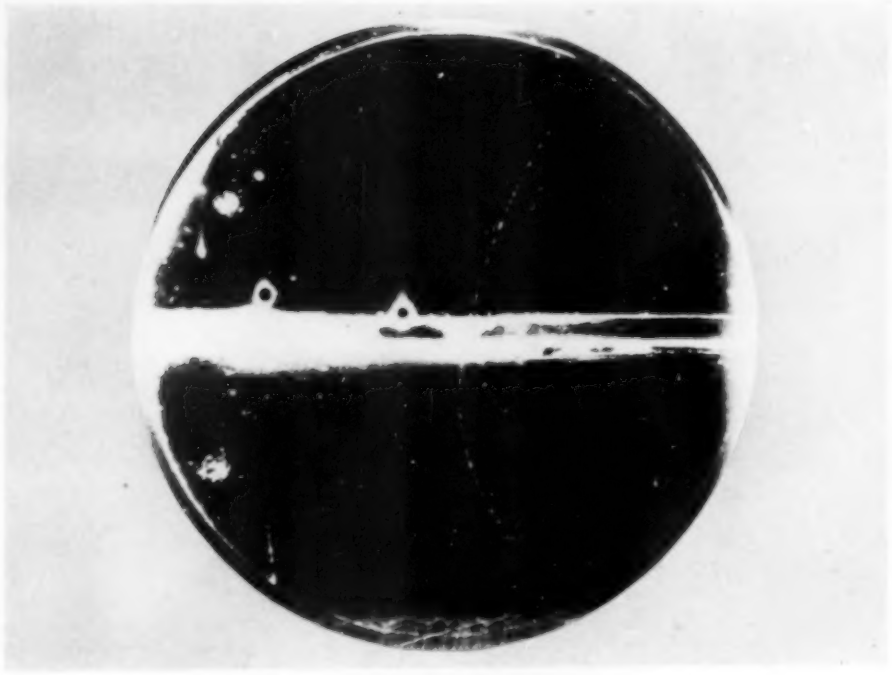
THE FIELD of molecular physics, of equal interest to chemists and physicists, has benefited from Professor Peter Debye's work. He is responsible for developments of extreme importance in the study of solutions, the electrical properties of insulators, the heat capacity of solids, and the structure of individual molecules. His work has provided the foundation for the methods which today are used to obtain as near as possible a "photograph" of an individual molecule. Of course, the "photograph" is not directly a picture of the inconceivably small molecule but rather a pattern from which a picture can be deduced by mathematical methods. Similarly, his mathematical deductions have led to a much clearer insight into the processes by which salt solutions conduct electricity—important to chemistry.

Electrical engineering as well as pure science has been benefited by his theories of electrical insulators, which are based on the idea that most molecules, although they contain equal quantities of positive and negative electricity, are electrically unbalanced inasmuch as one end of the molecule is positively charged while the other end is negatively charged. When a liquid containing such molecules is subjected to an electrical field, the molecules have a tendency to turn into line with the direction of the electric force. This very markedly affects the electrical properties of the liquid. Engineers are interested in these electrical properties while pure scientists are greatly interested in the information regarding molecular structure which Debye's theory yields.

Another very important application of mathematics was his treatment of the heat capacity of solids. The heat capacity of a substance is the quantity of heat which must be transferred to the substance in order to raise its temperature one degree. At very low temperatures, hundreds of degrees colder than room temperature, the heat capacity of all solids gets very small. Einstein gave the first explanation of this, and thus

PRIZE WINNERS

Dr. Carl D. Anderson, California Institute of Technology (left), is one of the winners of the Nobel Prize in Physics. Prof. V. F. Hess, University of Innsbruck, Austria, was honored jointly with Dr. Anderson. Prof. Peter Debye, Kaiser Wilhelm Institute of Physics (right), received the Nobel Prize in Chemistry.



POSITRON

This historic photograph, taken on August 2, 1932, by Dr. Carl D. Anderson, at the California Institute of Technology, is famous because it constitutes the discovery of the positive electron or positron. A 63,000,000-volt positron is seen passing through a six-millimeter lead plate and emerging as a 23,000,000-volt positron. The track consists of tiny particles of water collected along the path of the positron as it plunges through the moisture-laden atmosphere of the cloud chamber. The track is curved because the chamber is placed in a strong magnetic field. This may become one of the most famous photographs in physics.

paved the way for the more refined theory which Debye developed later. Although it was probably not foreseen at the time, this discovery also has industrial value since it is one link in a chain of calculations which can be used to decide whether or not a given chemical reaction will occur.

In spite of his long list of contributions, Professor Debye is only 52 years old.

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PHYSICS

Discovery of Positron One Of Science's Great Events

By WATSON DAVIS, Director, Science Service, writing in "Advance of Science"

THE DISCOVERY of one of the building blocks of the universe, the positron, was one of science's great achievements.

While most things about us seem to be solid, they are in reality made up of widely separated atoms, very tiny particles that in themselves may be thought of as miniature solar systems, consisting largely of open space. Inside the atom are found electrons, protons and possibly other particles.

Electrons have been known and studied for some forty years, ever since Prof. J. J. Thomson (now Sir J. J. Thomson) showed that cathode rays consisted of negatively charged particles far smaller than atoms. Dr. R. A. Millikan measured the negative electric charge on these electrons.

Electrons have proved to be nearly omnipresent. They are the stuff of electrical current. Metals are believed to be full of them. They are thought to be responsible for emission, absorption, and scattering of light. No atom could be complete without them. The electron is still, despite our changing ideas about ultimate, a fundamental particle.

In all these years of acquaintance with the negative corpuscle or electron, scientists felt very, very sure that there was no positively charged particle smaller than the proton, which was nearly two thousand times heavier. The first suggestion of a positive electron came from Prof. P. A. M. Dirac in 1931, when he put forth his theory of the electron. This prediction of a positive electron made scientists alert to the possibility of finding it in nature. But they did not know where to start to look for it.

The discovery was made in the course of experiments with cosmic rays at the California Institute of Technology. Dr. Carl D. Anderson had set up a Wilson expansion or cloud chamber on its side in such a way that cosmic rays might plow through the greatest possible length. He was photographing the long tracks that the cosmic ray particles leave behind them. An intense magnetic field was used to curve the particles and the amount of curvature gave an indication of the speed and energy with which they were traveling. This investigation was a part of the extensive program of cosmic ray research that Dr. R. A. Millikan had organized. It was not a search for the positive electron.

There was one feature of this expansion chamber, besides the intense magnetic field, that was unusual. Dr. Anderson placed a thin lead plate in it so that the cosmic rays and any particles that might shoot through the chamber would have something to try their energies upon. The Russian, Skobeltzyn, and others had previously watched and photographed cosmic ray cloud tracks, and Drs. Millikan and Anderson had adapted the method because of their hope that it would give information about the nature of cosmic rays.

In 1931, Dr. Anderson found that cosmic rays disrupt atoms of the air and other matter when they plunge earthward. He made photographs that showed particles, writing their paths in water droplets, curving in opposite directions under the magnetic influence, showing that they were oppositely charged with electricity. One such curving track was made, in a pioneer photograph, by an electron of 140 million volts energy. Another was made by a positive particle, which at that time Dr. Anderson guessed was a proton of about 70 million volts energy.

Here were projectiles of much higher power than physicists were in the habit of using in their researches. Here were transmutations on a grand scale of energies. Little wonder that young Anderson gambled harder than ever, risking the exposure of foot after foot of movie film in the hope of catching the atom smashing at exactly the right instant. Only the happenings during a fiftieth of a second could be caught at each try. Since the disrupting of atoms by cosmic rays does not happen every instant, many of the films were blank.

Then came August 2, 1932, and the making of the portrait of one of the most famous particles in all history. It

left a water droplet trail five centimeters long even after it plunged through six millimeters of lead. Carefully checking its curvature, inspecting the texture of the trail on the photograph, digging into the Dirac electron theory, Dr. Anderson concluded the positive electron had been caught. With due caution, he waited until two more similar photographs were obtained and then sent to *Science* the announcement of the discovery of the positive electron, a positively charged particle with a mass approximately equal to the ubiquitous negative electron.

He continued to make photographs, slowly accumulating in seven months fifteen photographs of positive electron tracks in a group of thirteen hundred photographs of cosmic ray tracks. Then in February, 1933, news came from Cambridge that in Cavendish Laboratory, the discovery of the positive electron was confirmed. Dr. P. M. S. Blackett and G. Occhialini had arranged their expansion chamber so that the passage of a cosmic ray through the chamber set up electrical impulses in two Geiger counters, one above and the other below the chamber. Only when both counters signaled at the same instant was a photographic plate exposed. The British experimenters found that some of their photographs showed "showers" or bursts of many tracks, all radiating from a single point. It was as though there had been an explosion. In the flying particles were positive electrons. There were ordinary common old-fashioned electrons as well. Dr. Anderson, too, found these showers. In many more cases than can be accounted for by chance, a negative and a positive electron were found to come from the same point. The significance of this may have important consequences. In giving birth to electron pairs, energy may be turning into matter. But that is another story.

Now that the existence of the positive electron was recognized as the result of work in two laboratories, it was time for it to be christened. Dr. Anderson named the child of the cosmic rays "positron." At the same time, for the sake of uniformity, he suggested that the name of the negative electron be changed to "negatron," but since the electron for forty-odd years has been called by its old name, it seems unlikely that scientists will take kindly to the new one. "Positron," since its coining, has been firmly written into the literature and promises to stick.

There was some objection to the disregard of mythology inherent in the word "positron." Prof. Herbert Dingle of Imperial College of Science and Technology in South Kensington, England, suggested the name "oreston" for the new positive particle. This is mythologically correct, for Orestes was the brother of Electra. Other English physicists had in the meantime contributed to the confusion, but not in a serious manner. The discovery of the positive particle came from the cosmic ray tracks that seemed to be bent in the wrong way. Sporting Englishmen immediately thought of cricket and the peculiar hops that the ball takes on bouncing in front of the wicket. These are called "googlies," so the new tracks and thus the particles in laboratory slang became "googlies" also.

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MEDICINE

Safer Morphine Invented at University of Virginia

MORPHINE more powerful and safer than the morphine that physicians now use to relieve suffering has been prepared and patented (U. S. Patent No. 2,058,521) by Dr. Lyndon F. Small of the University of Virginia.

The new kind of morphine—actually Dr. Small has patented three new morphine compounds — was discovered when Dr. Small was trying to develop a non-habit-forming substitute for morphine. The goal of non-habit-forming morphine is being sought in a fundamental scientific attack on narcotic drug addiction launched in 1929 by the National Research Council, the U. S. Public Health Service and the Treasury Department's Narcotic Bureau. The research on narcotic substitutes is being carried on at the Universities of Virginia and Michigan.

The new morphines which Dr. Small has just patented have not yet been tried on human patients. Tests on animals show that these new morphine substances are less poisonous than ordinary morphine; are more powerful so that smaller doses can be given; and act for a longer time, so that they need not be given as often as morphine in the relief of pain.

Because only animal tests have been made, no statement on the habit-forming possibilities of the new morphines can be made, Another morphine substitute, dihydrodesoxymorphine-D, which Dr. Small prepared two years ago, turned out to be more habit-forming than ordinary morphine, although preliminary tests encouraged the hope that it would be the long-sought non-habit-forming morphine substitute.

Clinical tests on human subjects of the new morphines will be made shortly.

The invention comprises three new ethers of morphine and dihydromorphine, in which the alcoholic hydroxyl group of the parent substances (morphine and dihydromorphine) has been etherified, viz:

1. Morphine alcoholic ethyl ether (heterocodethylin or heteroethylmorphine).
2. Dihydromorphine alcoholic ethyl ether (dihydroheterocodethylin, heteroethyldihydromorphine).
3. Dihydromorphine alcoholic methyl ether (dihydroheterocodeine).

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SEISMOLOGY

Kamtchatka Coast Shaken By Friday 13th Earthquake

KAMTCHATKA'S eastern coast was wrenched by a heavy earthquake on Friday, Nov. 13, at 11:31.5 p.m., local time (7:31.5 a.m., eastern standard time), according to calculations by seismologists of the U. S. Coast and Geodetic Survey, based on data collected telegraphically by Science Service. The epicenter was in approximately 57 degrees north latitude, 163 degrees east longitude.

Stations reporting were: Pennsylvania State College; Canisius College, Buffalo, N. Y.; Fordham University, New York City; University of Wisconsin, Madison, Wis.; University of California, Berkeley, Calif.; University of Michigan, Ann Arbor, Mich.; Franklin Institute, Philadelphia; Seismological Laboratory, Pasadena, Calif.; Dominion Observatory, Ottawa; Dominion Meteorological Observatory, Victoria, B. C.; Weston College, Weston, Mass.; the observatories of the U. S. Coast and Geodetic Survey at Tucson, Ariz., Ukiah, Calif., and Chicago, and St. Louis University.

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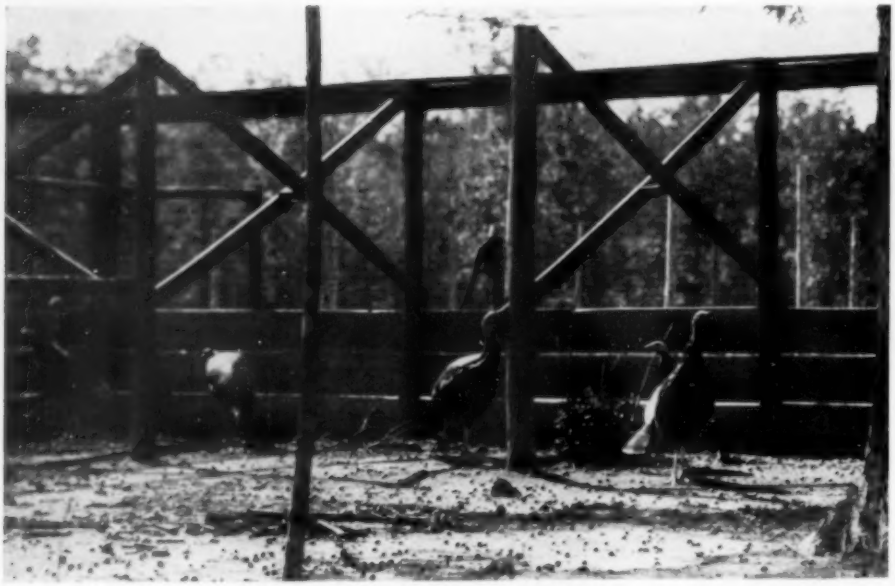

FIRST THANKSGIVING DINNER

Some of the few remaining representatives of the shy wild turkeys that were once hunted by the Pilgrim Fathers. Now, paradoxically, they must be carefully penned up to keep them wild.

CONSERVATION

Wild Turkeys, Nearly Extinct, Penned to Keep Them Wild

Captured Wild Birds Pine Away in Confinement So Specimens Were Obtained While in the Egg Stage

TURKEYS of the true North American wild species, such as supplied the first Thanksgiving feast, may some day abound again in Eastern woods, if a careful and ambitious breeding project now under way at Winewood, Va., succeeds.

For it must be realized that the holiday turkeys we buy in the market-place are not simply the old native species captured and tamed into barnyard fowls. The common domestic turkey, though closely related to the original wild turkey, is as much an immigrant as chickens and ducks and geese. Although it originated in Mexico, it came to the United States by way of Europe, having reached England through a very roundabout chain of trade from Spain.

Wild Turkey Virtually Extinct

In the meantime, our own wild turkey has become virtually extinct. Either it has been wiped out by hunters or, where wild birds survive, it has been mixed with domestic stock that has escaped from farmyards and taken to life in the open again.

But now, in an area in Virginia's historic Wilderness, where Grant and Lee once locked forces in the bitterest fighting of the Civil War, a serious effort is being made to bring the old wild turkey back. And, paradoxically enough, it proves necessary to put him inside a fence to keep him "wild."

1,200-Acre Bird Preserve

About seven years ago W. E. Wine, the present owner of Winewood, became interested in locating a place where the wild turkey could be found and preserved. At first it seemed that the Wilderness area of Virginia still had some of the pure strain wild turkeys left, so Mr. Wine purchased about 1,200 acres of timber land there and had elaborate pens and feeding sheds constructed.

When these arrangements were all completed, the keeper at Winewood trapped several native turkeys, retaining only those true to the wild type. After several years of selective breeding, however, occasional checks invariably showed domestic traits and markings in the younger birds.

Santee Swamp Searched

Mr. Wine, a true conservationist, refused to say die in behalf of the pure strain wild turkey. Instead, he secured the services of W. F. Welch, a veteran turkey raiser and a man who had devoted much time to the study of the wild birds' habits. Mr. Welch thereupon went to the Santee Swamps of South Carolina, a practically uninhabited area fifty miles from Charleston, where he spent two years securing wild birds for Winewood.

In the Santee area wild turkeys could be captured, but difficulty arose when an attempt was made to maintain them for breeding purposes. Unlike the Virginia turkeys, they either pined away in captivity or destroyed themselves. Finally this difficulty was overcome by locating nesting females, tracking them to their nests, and then placing the eggs thus secured under domestic birds imported into the Santee area for setting purposes.

Through these methods, Mr. Welch, after two years in the Santee Swamps, was able finally to return to Winewood with fifteen adult turkeys of the true wild strain. These are to constitute the nucleus of the restoration flock of genuine North American wild turkeys, such as the Pilgrim Fathers hunted.

As if carved from stone in bas-relief is the giant domestic turkey from the Winewood plantation shown on the front cover of this week's SCIENCE NEWS LETTER. To obtain the strange three-dimensional effect, Science Service Photographer Fremont Davis made an extra transparent positive and superimposed it on his negative. By offsetting the positive and negative slightly and making a single print from the two, the effect of sculpture is obtained.

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HEREDITY

Aged Twins Have Cancer Develop at Same Time

TWO old lady twins, 91 years of age, who both had developed cancer at exactly the same time were described by Drs. Samuel A. Munford and Hugh Linder, of Clifton Springs Sanitarium and Clinic, in a report to the *American Journal of Cancer*.

Not only did the cancer develop at the same time but it was located in exactly similar spots on the left breast of each. The mother, grandmother, and a maternal aunt also had had cancer of the left breast.

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BOTANY

Famous Botanical Collection Is "Refugee" from Spain

Plant Collection Made in Mexico in Eighteenth Century Has Now Been Brought to United States for Safety

PLANTS, no less than people, are among the refugees escaping from destruction in unhappy, revolt-torn Spain. The U. S. National Herbarium has just become host to part of one of the most famous collections of botanical specimens ever made in the New World, which was taken out of Madrid just before the present insurrection broke.

The collection, made in Mexico during the latter part of the eighteenth century, has already had a stormy and romantic history, including a previous "refugee" sojourn in France during the Napoleonic wars. Its present hegira to America ended at the doorstep of Dr. Paul Standley of the Field Museum of Natural History in Chicago, who divided it up and sent various sections to institutions where the botanists were specialists in the study of the particular groups of plants represented. The sections sent here include ferns, nettles, passion-flowers, and smilaxes.

The collection was started in 1787 by Dr. Martin Sesse y Lacasta, eminent Spanish botanist of that day, whom King Carlos III sent to Mexico to make a complete collection of the flora of that country and to set up a chair of botany at the University of Mexico. A young Mexican physician, Dr. José Mariano Mocino, joined him in the work, gave up medicine for botanical research, and returned with his chief to Spain in 1804. Upon the death of Dr. Sesse in 1809, Dr. Mocino, who had become Director of the Madrid Cabinet of Natural History, took full charge of the collection.

Through wars, imprisonment, exile, destitution, and ill health, the devoted Mexican botanist stuck with his precious collection. But after his death the valuable sheets of specimens lay neglected. Now, returned to the continent of its origin, though to a different country, it again assumes scientific importance.

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HE CAPTURED THE ELUSIVE BIRDS

W. F. Welch, veteran turkey raiser and caretaker at the Winewood wild turkey farms, near Parker, Va., feeds his trained "turkey" dogs which were used to find the rare fowl in the uninhabited Santee swamps of South Carolina.

LIBRARY SCIENCE

Urges Photographing Books As Preservation Measure

MICROFILMS—small sized images of books and documents upon motion picture film—give libraries an inexpensive method of preserving the written and pictorial record of our civilization.

This was made evident when C. G. Weber and J. R. Hill of the National Bureau of Standards reported to the Society of Motion Picture Engineers that the cellulose acetate or "safety" film used for such microfilms has "lasting qualities comparable with those of permanent record papers of high quality" and that the "optimal atmospheric conditions for the preservation of paper records are suitable for this film."

It was also emphasized that such safety films are no more inflammable than books and that hence they offer no new problems in fire protection.

Microphotographic duplication upon microfilm is coming into increasing use for making copies of rare and inaccessible books, for exchanging material between libraries and for making available material that could not otherwise be published. Science Service has sponsored the development of microfilms for use in connection with scientific literature.

The Bureau of Standards scientists tested the stability of both nitrate and acetate motion picture film. Cellulose nitrate film, the sort used in commercial motion pictures, is highly combustible and explosive. The nitrate film deteriorates beyond usefulness in 10 days when subjected to the accelerating aging test used upon record papers. This involves heating in a dry oven at the temperature of boiling water. The cellulose acetate or safety film, such as used for microfilm, withstood the oven-aging for 120 days without serious physical or chemical change.

This report is expected to encourage the use of microfilms in libraries and to allay any fear regarding how long they will last.

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The island of Socotra in the Arabian Sea is noted for its extraordinary plant life, including cucumber trees that shine in the sun like marble tombstones.

PHYSIOLOGY

Gland Transplants May Depend on Genetics

GENETICS may play an important part in the success of gland transplantations, it appears from studies reported by Drs. Hugo W. Nilson and Dwight J. Ingle of the Mayo Foundation, Rochester, Minn. (*Science*, Nov. 6.)

Adrenal glands, important little organs lying above the kidneys, were used in the studies. These glands were "exchanged" by transplantation between sister rats. These rats all lived and 60 days after the operation the glands were found to be in good condition and functioning normally. Similar exchange of adrenal glands between rats of different strains, cross-strain transplantation, was made on other rats. All of these animals died within 60 days after the operation. The cause of death was insufficient supply of the vital hormone of the adrenal glands.

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PUBLIC HEALTH

Conquering Diphtheria Involves Continuous Fight

CONQUERING diphtheria is not a static affair. Getting the upper hand over the disease by protective vaccinations of children is one thing. Keeping it is another. Even those communities with enviable records of large numbers of school and pre-school children immunized against the disease need to be constantly on guard against this horrible killer.

Up to now the fight has been carried on along the line of endeavoring to test all children, before they start to school, for susceptibility to the disease, and giving toxoid or toxin-antitoxin to those children found susceptible to diphtheria.

The next step is to retest the susceptibility of the children after a few years. The need for this retesting is brought out by Dr. Henry F. Vaughan, Commissioner of Health of Detroit, in a report to the *Detroit Medical News*, official publication of the Wayne County Medical Society. (Nov. 9.)

Protective treatments will "control diphtheria," Dr. Vaughan declares, but in a fair proportion of treated children, the protection does not last for life.

"Since September 1 there have been reported 63 cases of diphtheria in Detroit," Dr. Vaughan states. "At the present time there are 35 cases under quarantine. These are more cases than we have had at this time of the year during the past several years. Of the current cases about three out of four are among school children.

"Three doses of toxin-antitoxin, two doses of simple toxoid, or one dose of alum precipitated toxoid does not imply life-long protection. There is plenty of evidence to indicate that as many as one-third of the children will lose some of their protection within five or six years. The only way to be sure whether the protection remains is to give the Schick test."

The Schick test is the one which shows whether or not a child is susceptible to diphtheria.

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PHYSIOLOGY

Can Extend "Prime of Life" by Suitable Diet

OLD AGE can be held at bay and life itself prolonged some seven years by dietary means. Evidence for this has been obtained in nutrition studies with rats, made by Dr. Henry C. Sherman, Mitchill professor of chemistry at Columbia University and research associate of the Carnegie Institution of Washington.

The diet which extended the prime of life in rats had an increased proportion of milk, making the diet richer in vitamins A and G, calcium and protein, Dr. Sherman reported in a lecture at the Carnegie Institution.

This diet "expedited growth and development, resulted in a higher level of adult vitality as shown by several criteria, and extended the average length of adult life, or improved the life expectation of the adult."

Extension of life expectation has heretofore been made for lower age levels by hygienic means which reduced the chances of death by diseases of infancy and childhood. By applying the new knowledge of nutrition, Dr. Sherman believes it is now possible to extend life during "the period of the prime."

Because eminent men usually attain their positions of "fullest opportunity" at an age when only the last third of their years remain to render "fullest service to the world," Dr. Sherman believes that the possibility of extending the prime period of life has greater than biological significance.

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IN SCIEN

RADIO

Liner Uses Beam Radio To "See" Through Fog

LITTLE mentioned and still in experimental use on the S. S. *Normandie* are ultra-short radio wave devices which can detect fog-obscured obstacles in the path of the vessel up to a distance of four and a half miles.

The French society of radio electrical engineers developed the experimental equipment which looks like two searchlights mounted about twenty feet apart.

What appear to be searchlights, high on the forward part of the *Normandie*, are in reality the transmitting and detecting mirrors of the ultra-short radio waves. Idea behind the apparatus is that the radiation emitted in a beam will strike the obstacle ahead, and that the small part of the reflected energy will be detected by the receiver in the other mirror.

The special vacuum tube wave generator produces radio waves whose length is only 12 centimeters or about five inches.

Science News Letter, November 21, 1936

ARCHAEOLOGY

Digging at Kish Reveals International Trade

EVIDENCE that international trade began before 3000 B.C. has been unearthed in the ruins of the Babylonian city of Kish.

The discovery, made by the Field Museum-Oxford University Joint Expedition to Mesopotamia, consists of pottery objects of highly polished fine black ware. This black pottery is pronounced identical with ware made in ancient times in Anatolia (modern Turkey) and in northern Syria.

Even more distant trading at Kish with cities of India over a thousand miles away is shown by finding decorated stone bowls like bowls from ruins of Mohenho-daro, India, dating between 3000 B.C. and 2800 B.C. Beauty figured in the early international trade, it appears, for two cosmetic jars of alabaster, unearthed at Kish, are identified as links with Persia.

Science News Letter, November 21, 1936

FIELDS

CONSERVATION

Want to Buy a Bison? Uncle Sam Will Sell

DO YOU want to buy a bison? Or a real, live elk?

If you do, better get your order in soon. Uncle Sam is conducting another of his annual sales of surplus big game animals. The Biological Survey, U. S. Department of Agriculture, is acting as salesman, and can give further information to all parties interested.

These annual sales, which have become a more or less regular institution, are conducted to lighten the load on the various big-game ranges in the West, which can support only herds of definitely determined sizes. If any unsold animals are left after a suitable time, they will be given free to public or private institutions for propagation or exhibition. But these gift animals are not scot-free: the recipient has to pay costs of capture and delivery.

Science News Letter, November 21, 1936

DENDROLOGY

Painstaking Scientist Counts Needles on Pines

REMINISCENT of the Biblical dictum, that "the very hairs of your head are all numbered," is the tedious but scientifically and practically significant task of counting all the needles on two pine trees, recently completed by Dr. A. L. MacKinney, silviculturist of the Appalachian Forest Experiment Station at Asheville, N. C.

Dr. MacKinney and assistants have just completed an extensive study of pine trees. He made the painstaking needle-count, together with other studies, with the aim of finding out how bigger profits can be made from growing timber.

Dr. MacKinney discovered that pine trees, in so far as their needles are concerned, are like men's heads—some have thick growths and some are almost bald. For his experiment he selected two loblolly pines. Both trees were 66 years old. The first tree measured twelve inches in diameter, and was 34 feet from the bottom limb to the top. The other tree was ten inches in diameter, was 69 feet tall and 17 feet from the first limb to the top.

The first tree had 325,000 needles and the other had only 30,000 needles. The first tree had nearly 4,000 square feet of leaf surface which, if spread out, would have covered the floors of 25 ordinary rooms. The needles, if laid end to end, would have extended more than 15 miles.

Dr. MacKinney explained that much of the food for the pine tree is manufactured in the needles. These thousands of needles, he said, could not make the food for the tree unless they were exposed to the sun, and thus the amount of leaf or needle surface exposed to the sun determines the growth and health of the tree.

Therefore, he explained, trees that grow out in the open like an apple tree in an orchard furnish more cubic feet of wood than those which grow in dense stands.

Science News Letter, November 21, 1936

HOROLOGY

Twin Microphones Quickly Test Accuracy of Watches

AN ELECTRIC "stethoscope" which listens to the beats of watches and registers on a visible dial whether the watch being examined is running fast or slow, is described in a patent (No. 2,050,866) granted to R. Tamm, of Berlin, Germany.

The stethoscope is designed to do away with the present time-consuming method of testing watches, which sometimes involves many adjustments and a week or more before a high degree of accuracy is obtained.

By means of two microphones, one of which is placed over the standard watch known to be accurate, and the other over the watch to be tested, the stethoscope listens to the watch ticks. Picked up by the microphones, the beats are amplified and set up corresponding fluctuations in an electric system which acts as an analyzer.

If the deflection of the needle in the device increases as shown by a dial, it indicates the watch under test is running fast or gaining time. If it decreases, the watch is running slow.

Big advantage of the stethoscope is that adjustments can be made in a few minutes, whereas conventional testing may require 24 hours or more.

Science News Letter, November 21, 1936

PHYSICS

To Test Prison Bars by Their Magnetic Behavior

NEWEST aid of science in combating crime is the magnetic apparatus developed at the National Bureau of Standards to test the properties of tool-resisting prison bars. The device was developed by R. L. Sanford, senior physicist at the Bureau, at the request of the Bureau of Prisons and the Department of Justice.

At the meeting of the Philosophical Society of Washington Mr. Sanford showed how a non-destructive test on prison bars had been achieved with his alternating current magnetic comparator. Usefulness of the device will be to test new bars purchased by the Federal government for prisons.

Prison bars, disclosed Mr. Sanford, are really two bars blended into a solid whole. Outside is softer ordinary steel which can be cut with a hacksaw. But within are inserts of hardened steel that cannot be cut by any tool which a prisoner is likely to obtain.

This dual type of construction of bars is necessary because the inner, very hard, steel is brittle and if used alone might be shattered by a sharp blow in quite the same way that one may break the blade of a knife if it is used as a screw-driver.

In the prison bars the outer, softer material absorbs the shock of a blow and protects the inner, hard material from fracture. Moreover, the outer steel is an excellent heat conductor and prevents the prisoner from heating the inner steel if he employs a home-made blowtorch consisting of a candle and a soda straw.

The prison bars are tested in a balanced electrical circuit which can be thought of roughly as an electrical scale in which the magnetic properties of a standard and test sample of steel are compared.

Primary premise behind the device, stated Mr. Sanford, is that two steel bars which are alike chemically and structurally will be alike, also, in magnetic properties. And that it is impossible to do anything to a piece of steel which will change its strength without, at the same time, altering its magnetic properties. Thus, if one finds that the magnetic properties of the sample correspond to those of a known, approved standard the two are otherwise alike also.

Science News Letter, November 21, 1936

INVENTION

Drama and Radio Methods Used to Demonstrate Science

Spotlights and Soft Music Help to Focus Attention As Research Parade Gives Hint of Future Achievement

SCIENCE is turning to the movies, the radio and the stage for hints as to how to demonstrate its latest achievements.

One of the features of the Centennial Celebration of the American Patent System to be held on Monday, Nov. 23, is a new kind of scientific demonstration program during which there will be made known important scientific achievements that promise to raise the standard of living for the future.

This preview of science is being arranged by Science Service with the assistance of leading scientists throughout the country. It will be called "Research Parade."

In a new mode, combining the techniques of stage, movies and radio with those of the lecture platform and scientific meeting, Research Parade will dramatize typical science achievements of today that may be applied to industry, home and health tomorrow. There will be continuity of idea and method. Much of the explanation will be accomplished by a voice that will bind the demonstrations together in a manner similar to that of the news reel commentator. Spotlights will be used to focus the attention of the audience upon the demonstrations. Music will be used as overture and at other times.

More than a thousand leading inventors, industrialists, patent lawyers and scientists are expected to attend the celebration, another feature of which is a "patented dinner," all the food and drink of which is covered by patents.

Watson Davis, Director

The Research Parade is being arranged and directed by Watson Davis, director of Science Service.

Dr. V. K. Zworykin, the inventor of the system of television used by Radio Corporation of America, will demonstrate how the electron image tube can be applied to microscopic research.

High frequency sound and its unusual effects will be shown by Dr. R. W. Wood, chemist and physicist of Johns Hopkins University.

Possibilities of direct current transmission of electric power which promise important developments in this important field will be announced by Dr. Albert W. Hull of the General Electric Company.

How the dangers of auto headlight glare may be avoided in the future is to be demonstrated by Dr. L. W. Chubb of the Westinghouse Electric and Manufacturing Company.

The great enigma of the forest, the chemical called lignin, will be subject of the U. S. Forest Products Laboratory's presentation by Dr. Carlile P. Winslow.

Artificial rubber will be shown by the E. I. du Pont de Nemours and Company, while glass in new forms will be spectacularly displayed by Dr. J. C. Hostetter of the Corning Glass Works.

Science News Letter, November 21, 1936

BOTANY

More Than 200 New Plants Patented Under New Law

DESPITE the fact that over 200 plant patents have been granted by the U. S. Patent Office since such patents on flowers, fruits and vegetables became legal in 1930, the field of patented plants is virtually untouched.

Material prepared in connection with the coming Centennial Celebration of the American Patent System on Nov. 23, 1936, shows this fact as a logical conclusion.

Here are some of the future possibilities of the effect of plant patents on everyday life:

1. Forest trees as an annual crop, like oats and potatoes.
2. Oranges and bananas grown outdoors in Maine.
3. Apples and peaches six inches in diameter.

Such apparent fantasies appear remote at the present time, but much less so than the idea of the radio or airplane seemed to the old patent examiners in 1836, when the present patent system was just beginning.

Queen Elizabeth, it is disclosed, granted what were virtually the first plant patents—except in name—in the famous monopolies given to favored individuals for exclusive rights to flax, hemp, currants and medicinal and dye plants.

In the early American colonies monopolies of any form were extremely unpopular. Most of all the dislike was centered on any plant which was considered the gift of nature for all to use as they liked. No one, at that time, foresaw possible research and invention aimed primarily at bringing new and different plant forms, intentionally and for profit.

Thus agitation for plant patents continued from 1868 until 1930 before it was finally enacted into law.

Here are a few of the patented fruits, flowers and vegetables which you can buy today:

Apple, apricot, avocado, blackberry, carnation, cherry, chrysanthemum, dahlia, gardenia, gladiolus, grass for golf greens, grape, grapefruit, peach, pecan, plum, rose, strawberry and waterlily.

Science News Letter, November 21, 1936

ENGINEERING

Philharmonic Orchestra Joins Factory in Symphony

A TWENTIETH century symphony of music in which one of the nation's leading philharmonic orchestras will play the accompaniment for the myriad sounds that come from the production of an American motor car, will be presented in Washington, Nov. 23, as part of the Centennial Celebration of the American Patent System.

The linking of the music of the Detroit Philharmonic Orchestra and the hammering, welding, stamping, fitting and finishing of automobile production will be achieved in a sound motion picture which is expected to be chosen for a place on the program of industrial motion pictures to be presented in the Department of Commerce auditorium in connection with the coming patent centennial.

The industrial films to be chosen for the program will be selected by a committee of judges of the Washington Junior Board of Trade of the Junior Chamber of Commerce from a list of 15 submitted to E. Willard Jensen, chairman of the arrangements committee of the centennial, and to N. D. Golden, chief of the motion picture section of the Bureau of Foreign and Domestic Commerce.

Other films in- (*Turn to page* 335)

INVENTION

Century of Science Progress Reviewed for Celebration

Patent System Is Now an Even Century Old; Before That Patents Were Granted by President and Cabinet

FROM files of the U. S. Patent Office a swift-moving panorama of the nation's progress in industry and agriculture—as marked by the basic patents it has issued to inventive genius—is emerging in review for the past century.

The National Committee for the Celebration of the American Patent System on Nov. 23 in Washington points out that before 1836, patents were issued to individuals only by vote of the President's Cabinet and required the signatures of the President of the United States and the Secretary of State.

When John Quincy Adams affixed his signature to a patent for John Moon's "new and useful improvement in his machine for shelling corn" in 1825 or to Chester Stone's washing machine in 1827 he probably had as little foresight of the rising trend of invention leading up to applications for television inventions a hundred years hence as the average individual has today of developments to come 100, 50, or even 5 years from now. These will certainly include practical television; possibly wireless transmission of power, glass paints for art portraits, a revolutionized farm industry in which one acre will produce the equivalent of 50 today, synthetic motor fuels, and a host of other fascinating possibilities already on the horizon.

When the United States was primarily an agricultural country the thoughts of inventors naturally turned to machines which would increase production and lower labor costs. Thus in 1794, 18 years after the Revolutionary War, Eli Whitney received a patent for his cotton gin and laid the foundation for the South's basic agriculture for a hundred years to come.

HOME OF PATENT OFFICE

Taken from the top of the Washington Monument, this view shows the U. S. Department of Commerce Building which houses the Patent Office and, at the right, other new government buildings.

What Whitney did for the South another southerner, Cyrus H. McCormick, a Virginian, did for northern and western farmers who found grain their most profitable crop. In 1834 McCormick received a patent on his first crude grain reaper, upon which all subsequent harvesters up to the present giant power combines of midwestern prairies have been built.

Twelve years before McCormick, however, another inventor, T. Howe obtained a basic patent on a horse-driven "thrashing machine" which promised to rid man of the laborious task of flailing his grain and separating the chaff from the grain by throwing it up into the wind. The two machines today are combined in the present machine which cuts, threshes, separates, weighs and sacks the grain production of millions of American acres.

"Telegraph Signs"

In 1840 Samuel F. B. Morse patented his "telegraph signs." Old patents also reveal that Alexander Graham Bell was a telegrapher before he invented the telephone, having patented in 1876 an apparatus for transmitting "two or more telegraphic signals simultaneously" on a single wire by instruments which set up "a succession of electrical impulses differing in rate from the others." Following him came Emile Berliner of Boston for a patent on a "microphone or contact-telephone" and Francis Blake of Weston, Mass., who patented in 1881 a "speaking telephone." In 1892 appeared a patent granted to Thomas A. Edison for a "speaking telegraph" and in the same year the dial telephone system was conceived in a patent granted Almon B. Strowger of Chicago for an automatic telephone exchange.

Marconi Experiments

Wireless telegraphy came into being with the experiments of Marconi at the turn of the century and in 1906 Henry H. C. Dunwoody of Washington patented such a system. By 1914, E. H. Armstrong of Yonkers, N. Y., received a patent for a wireless receiving system and three years later Carl R. Englud of New Jersey patented an apparatus for "radiotelephony." In 1906 Lee de Forrest of New York City obtained a patent on the heart of radio, the vacuum tube.

When electric lighting was just around the corner in 1879, C. F. Brush of Cleveland, O., patented his carbon arc lamp and a year later the versatile Thomas A. Edison patented the incandescent electric lamp. In 1888 Nikola

Tesla of New York City had patented a device for the "electrical transmission of power." In 1907 J. A. Heany of York, Pa., received a patent on the hair-filament tungsten wire for such lamps and in 1912 Peter Cooper Hewitt of New York City conceived and patented the mercury vapor lamp to simulate daylight in artificial lighting.

The motion picture industry was born back in 1893 when Thomas Alva Edison patented his "apparatus for exhibiting photographs of moving objects" which is basically the movie camera of today, and in 1897 added the "kinetographic camera" for making the photographs to be exhibited.

Sound pictures were conceived much later when the phonograph and motion pictures were combined, but in 1878 Edison patented his first phonograph or "speaking machine" with its wax cylinders for recording sound.

Today's streamlined automobile was the "road engine" patented by G. B. Selden of Rochester, N. Y., in 1895 which proposed the use of an early Diesel, or compression-ignition, engine for power and was to stop with a hand-operated brakeshoe on the rear metal tires. The patent on the machine was later revoked after it was declared impractical by the courts. In 1903 Clyde J. Coleman of New York City patented a device which included a "starting motor" for the motor vehicle and applied the power to the rear instead of the front wheels.

Vulcanized Rubber

The birth of the rubber tire, tending to make riding easier, came back in 1844 when Charles Goodyear of New Haven, Conn., patented the process of preparing vulcanized rubber from caoutchouc, or India rubber.

When the automobile industry was thus in its infancy two Ohio boys, Wilbur and Orville Wright, were perfecting in their Dayton bicycle shop the first successful heavier-than-air flying machine, which they patented on May 22, 1906. Nine years later Glenn H. Curtiss patented a similar machine and in 1919 another milestone in aeronautics history, the patenting of the trademark "Liberty" for the famous aircraft engine of that day, was recorded.

The World War, which stimulated the perfection of the Liberty engine, obscured the patenting in 1918 of one of aviation's greatest aids, the gyroscopic compass, by Elmer A. Sperry. Later inventions based on the gyroscopic principle have culminated in the automatic gyro pilot, first tested thoroughly by the late Wiley Post in his solo round-the-world flight, which will fly a plane automatically until the gas runs out and then land it on an even keel if no trees and hills are in the way.

Aluminum is one of the commonest metals used today, finding uses ranging from airplane and automobile parts to artificial bones for the human body. But until 1889, when the youthful Charles M. Hall of Oberlin, O., patented his electrolytic process for extracting it, aluminum was used primarily in expensive jewelry and for other aristocratic applications, such as the helmet which Napoleon III wore with considerable pride.

Plastics in 1870

The era of plastics, the tough, hard, non-burning substitutes for wood and metal which can be molded readily from a semi-liquid state, had its beginning in 1870 when John and Isaiah Hyatt of Albany, N. Y., patented a method for treating and molding pyroxyline. Thirty-nine years later Leo H. Baekeland, known as the father of the plastic industry because of his discovery of Baekelite, obtained two patents on methods of creating the new products.

Modern newspapers, with their frequent editions, fast market and sport reports, and split-second presentation of the news, owe their hold on the public to Samuel F. B. Morse and his telegraph; to Ottmar Mergenthaler of Baltimore who patented his first linotype, or machine which speeded up the setting of type; to Henry A. Wise Wood of New York City who patented in 1903 his machine for making printing a continuous process by casting type on cylinders; and to F. E. Ives of Philadelphia who patented in 1893 a process for making half-tone pictures.

Implements of war have been a favorite field of American inventors. An early patent on a "sub-marine vessel" was granted to L. D. Phillips of inland Michigan City, Ind., in 1852 and other patents on similar vessels were issued leading up to the "submarine locomotive" of Simon Lake in 1896 and the submarine boat of John P. Holland of Newark, N. J., in 1902.

The single-shot, muzzle-loading pistol gave way in 1836 to Samuel Colt's "revolving gun" and the machine-gun was born in 1862 when R. J. Gatling of Indianapolis, Ind., patented his famous six-barrel, rapid-fire cannon which came into its own during the Spanish-American war.

Rapid transportation by train and bus would be impossible today without the swift-acting, dependable air brakes which were perfected by George Westinghouse Jr., of Schenectady, N. Y., in 1869. Nine years before, however, Nehemiah Hodge of North Adams, Mass., received a basic patent on an air brake and in 1879 was granted a patent on vacuum railroad brakes.

The cash register came into being in 1883, patented by James Ritty and John Birch of Dayton, O.; the typewriter was patented in 1868 by C. Latham Sholes, Carlos Glidden and Samuel W. Soule of Milwaukee, Wis.; the vacuum sweeper was patented by Ives W. McGaffey of Chicago in 1869; Eli H. Janney of Alexandria, Va., patented a successful appliance for coupling railroad cars in 1873; and Elias Howe, Jr., of Cambridge, Mass., patented his first sewing machine in 1846.

Patent Number One

Just 100 years ago, in original Patent No. 1, Senator John Ruggles of Maine patented cog gears, which he called "traction wheels"; the barbed wire fence was patented by Joseph F. Glidden of DeKalb, Ill., in 1874; the first electric flatiron was patented by Henry W. Seely of New York City in 1882; electric welding came into being with the patent granted Elihu Thomson of Lynn, Mass., in 1886; the player piano arrived with a patent granted William B. Fleming of Detroit, Mich., in 1889; and King C. Gillette of Brookline, Mass., patented his safety razor in 1904.

These were the inventors who during the past 100 years ushered in the modern miracles of steel, electricity, radio, plastics, air and land transportation through their experiments with wires, rods, wheels, gears, exploding gases and electrical impulses, often struggling against the objections and opposition of their families, friends and business associates until eventual success brought acclaim and in some instances adequate monetary rewards.

BIOLOGY

NATURE RAMBLINGS
by Frank Thone

Breathing Without Lungs

SOME animals are able to get along quite well with neither lungs nor gills.

Ordinarily, we think of lungs as absolutely indispensable for backboned animals that live on land, and of gills as equally necessary for their relatives that spend their lives in the water. But the lungless salamanders, which are rather scarce, shy creatures related to the more familiar frogs and toads, have no gills, and their lungs have degenerated into mere rudiments without function.

The answer to this physiological riddle is partly the same as Terence Mulvaney's to the question how a lot of soldiers got drunk with no visible means of inebriation: "They sukk it in through their skins."

The skins of the amphibia (frogs, salamanders, and their relatives) are thin and scaleless, and the tiny, thin-walled blood vessels crowd close to the surface. So long as the skin is moist, oxygen can pass in and carbon dioxide come out at any point on the body. The creature's whole outer surface thus becomes a sort of auxiliary lung.

Amphibia also practice what is known by the rather terrifyingly long name of buccopharyngeal respiration. Translated from its polysyllabic Greek into English, this means merely breathing with the mouth and throat. Most of the animals in this group have their mouth and throat cavities thickly lined with minute blood vessels, so that interchange of oxygen and carbon dioxide can go on there as well as in the lungs or through the skin.

The lungless salamanders have simply been able to develop the two auxiliary means of getting oxygen, through their skins and in their mouth-and-throat breathing, up to the point where they can get along without any lungs at all. So they don't have any.

There are other curious developments of this auxiliary breathing among the amphibia. Frogs that live in rapid, cold streams and have thin skins very often possess undersized, underdeveloped lungs, while the commoner frogs, that live ashore most of the time, have thicker skins and more highly functional lungs.

Perhaps the oldest among skin-breathers is the so-called hairy frog of Africa. During the mating season, when the males need an extra supply of oxygen, they develop gill-like growths on their sides and hind legs, that look like veritable fur pants.

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MEDICINE

CCC Men Help in Search For Ivy Poison Preventive

ONE HUNDRED THIRTY men at the CCC veterans' camp, MC-64, Morristown, N. J., served as willing guinea pigs to prove that there is a preventive and a definite cure for ivy poison. Lieutenant-Colonel J. M. Blank, U. S. Medical Reserve Corps, and Dr. Arthur F. Coca, Pearl River, N. Y., physician whom he called in as a consultant in the work, describe its results. (*Journal of Allergy*, September.)

From January the entire command of "2217 V," which includes the Morristown camp, was engaged in mosquito control in New Jersey. This involved much labor and scouting in swampy areas where poison ivy and poison sumac abound. As a result, there had been 129 cases of poison ivy by April 24, sixteen of them so bad they had required hospital care. The morale of the camp, the report continues, was being adversely affected, and still the number of cases increased.

No really critical tests had ever been made of prevention of the irritation by immunizing with injections into the blood stream, the best method to use if it would work. The doctors determined to try this way.

They divided the men into three groups. The first received a fairly weak injection of the actual irritant from poison ivy plants in four weekly doses. This caused their blood to prepare a material which would fight off the poison itself when they came into accidental contact with the plants, just as people vaccinated against typhoid fever acquire immunity to that disease. Of the 45 men in this group, only 9 reported poison ivy infection in the 6 weeks following their treatment. A second group was given similar injections, 12 times as strong as the first. The ensuing 6 weeks saw 3 cases develop among them. A third lot, of 45 men again, got no injections. Of these 45, 30 got poison ivy! Members of each group were in each of the work gangs.

The report concludes on a faintly regretful note. As each man was found to have the skin irritation, he was given the anti-poison-ivy injections. Routine inspections saw to it that the cases were diagnosed early. The number of cases decreased from the hundreds earlier in the year to none at all in August. There was one case in September, but that was of a man who had not been immunized.

The regret of the doctors lies in the fact that because of this practice of treating the men as they became ill, nobody was left unvaccinated at the end of the treatments who could be used to tell quite certainly whether the men were being exposed as much as before to the poisoning.

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Brazil is experimenting with the silk-worm industry.

DR. W. E. RITTER
Celebrates eightieth birthday.

BIOGRAPHY

"Unity" is Philosophy of Dr. William E. Ritter

"UNITY" would be the guide-word for the life of Dr. William Emerson Ritter, now reaching its eightieth milestone—if so varied a life could be oriented upon a single word. Researcher, teacher, director of a great biological institution, philosopher, counsellor to a newspaper-business genius, the late E. W. Scripps, co-founder with him of Science Service, Dr. Ritter reverts again and again, through all his multiplex activities, to the single and binding idea of unity.

Unity in the living animals he studied, underlying and dominating the apparent mosaic-like distinctness of parts and activities. Social unities within groups. Unity, not dualism, of body and mind in man. Unity not only in the final stage but in every step throughout development. He sees life steadily, and insists upon seeing it whole.

This idea of continuing developmental unity is brought to especially sharp focus in the concluding chapter of one of his books, "The Natural History of Our Conduct," wherein he elaborates upon a theme set forth by naturalists as far back as Aristotle: the interdependence of head and hands in human evolution and life.

Only a creature with a head and mind like man's can make use of human hands, Dr. Ritter points out. Conversely, only with hands like man's can the biddings of the human head be carried out. Imagine the helplessness of a being with a human head and the forelimbs of a dog or horse; or the uselessness of one with human hands and the head of an elephant or an alligator. Human head and human hands simply belong together; they are not imaginable separately; they form a unity.

They form a unity now because they evolved as a unity, Dr. Ritter continues. Head, having flexible, adaptable hands at disposal, can invent new things to do, and hands will faithfully perform, particularly since tools in wide variety can be used as auxiliary organs. Hands, having remained in an unspecialized state, keeping the full set of fingers and developing an opposable thumb, can offer head ready cooperation.

As a natural being, the birth of ages of evolution, man is in a startlingly literal sense self-made. His whole body, but especially his head, is the work of his hands.

Dr. Ritter is honorary president of Science Service and professor emeritus of zoology at the University of California. His eightieth birthday occurred on Thursday, Nov. 19. He is now working on an extensive study of the California woodpecker, which will be published soon.

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PHYSICS

Changes in Science Education Urged by Industrial Physicists

DRASTIC changes in the kind of scientific education needed to place more graduate physicists in industry were outlined at the meeting of the nation's five leading societies of physics.

The American Institute of Physics, it was revealed, has queried fifty of the country's leading industrial physicists to find out what industry wants in the oncoming generations of scientists and what is wrong with the present system of training them.

Too much emphasis on the so-called "new" physics with its atoms, atomic nuclei and theoretical mathematics on the structure of the atom and a consequent lack of the older but more practically useful "classical" physics was a major criticism advanced by the industrial replies as outlined and interpreted by Dr. Homer L. Dodge, dean of the University of Oklahoma Graduate School, and Dr. A. R. Olpin, director of research of Kendall Mills, Boston.

Industries need physicists trained in the fields of optics, magnetism and acoustics, it was disclosed, and yet too little emphasis is placed on these fields of physics in academic training, either undergraduate or graduate. The reason is that the best known scientists are working on the problems of cosmic rays, atomic disintegration and transmutation, and the younger students naturally look up to them for guidance and inspiration.

The personality of a prospective physicist entering industry is as important as his technical and scientific knowledge, in the opinion of some of the industrial research leaders queried. The need is great for men who can work with, and lead, others.

Industry has little use for the eccentric, brilliant but self-centered research scientist, Dr. Olpin said. Boldness of imagination, daring in conception, courage for change and vigor of conviction are some of the qualities demanded of industrial physicists today just as much as comprehensive technical training. An industrial research man should be able to express himself clearly to any type of audience and be able to break down, as do the science writers for newspapers, the barrier which exists between technical shorthand symbols and terms and the language of the layman. The value of extra-curricular activities in this connection was stressed.

Some training in engineering courses is advocated for future industrial physicists, but it is easier to use an employe trained adequately in physics and have him attain engineering knowledge in the plant than to try to give an engineering student additional knowledge of physics.

Physicists receive adequate training in mathematics, it was shown by the survey, but it is not taught properly. As one research director said:

"It is one thing to solve a neat row of mathematical symbols and quite another to understand a problem well enough to set up a differential equation, determine the constants of integration

and keep one's feet on physical ground through the whole process."

If in mathematics the need is for better training rather than more of it, the opposite is true in chemistry training for industrial physicists. Most industrial laboratories do not employ physicists as such because few physicists have had sufficient chemistry. Yet the industrial chemists do much work which is strictly physics. In smaller companies, especially, the scientist desired must know science rather than merely chemistry or physics.

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cluded in the group are those showing in detail the vaporization and explosion of a drop of gasoline in an automobile engine cylinder; the operation of the cooling system of an automobile; simple methods and precautions by which fire and highway accidents can be avoided; the "New Frontiers" of the electrical industry; the operations of modern gas, electrical, and transportation facilities; the making of steel; and the drama of invention and research remolding the life of American people.

One special film will tell the story of chemistry in modern life as portrayed through the development of artificial dyes, fabrics, explosives, paints, and hundreds of other products by tearing down and recombining the basic molecules of matter.

Lowell Thomas, Boake Carter, and John S. Young are listed among the well-known commentators of the present day who supply the descriptive sidelights on the films.

Showing of the selected films will be open to the public on the centennial celebration day, Monday, Nov. 23, following which some of them will be dispatched on a nation-wide tour sponsored by the Junior Chamber of Commerce. Plans of the group also call for presentation of prints of these films to the National Archives as a nucleus for its collection of outstanding motion pictures of the present age.

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A slice of iron meteorite with a small diamond projecting from its surface is an unusual specimen recently brought to scientific notice.

Among the industrial by-products which are seen as possible livestock feeds are walnut oil meal, tomato cannery waste, grape meal, and hempseed meal.

•First Glances at New Books

Biography

PASCAL, THE LIFE OF GENIUS—Morris Bishop—*Reynal & Hitchcock,* 398 p., $3.50. A satisfactory biography of high literary and factual quality. Pascal's many facets are exposed in chapters treating him as prodigy, inventor, convert, physicist, mathematician, man of the world, lover, mystic, penitent, polemist, philosopher, saint and man.

Science News Letter, November 21, 1936

American Archaeology

ANCIENT LIFE IN MEXICO AND CENTRAL AMERICA—Edgar L. Hewett—*Bobbs Merrill,* 364 p., $4. A companion volume to the author's "Ancient Life in the American Southwest." In this new book, Prof. Hewett fits ancient ruins and living communities of the tropics into the panorama of native American life. "What I most desire to impress," he writes, "is that culture in ancient America had reached, in most places, a plane of sustained value. . . . It was the product of disciplined, directed skill, sustained by profound appreciation of esthetic values, and, underlying it, a philosophy of life which promises rich reward for painstaking study."

Science News Letter, November 21, 1936

Astronomy

THE HANNA STAR DOME—Dorothy A. Treat—Cleveland Museum of Natural History, 47 p., illus., 25c. Vest-pocket-sized guide for use in connection with a unique astronomical exhibit in the Cleveland Museum, containing much information in very little space.

Science News Letter, November 21, 1936

Physiology—History of Science

A DISSERTATION ON THE SENSIBLE AND IRRITABLE PARTS OF ANIMALS—Albrecht Von Haller with introduction by Oswei Temkin—*Johns Hopkins,* 49 p., $1. Reprint of one of the great classics of science, first presented in 1752.

Science News Letter, November 21, 1936

Gardening

THE TROPICAL GARDEN, ITS DESIGN, HORTICULTURE AND PLANT MATERIALS—Loraine E. Kuck and Richard C. Tongg—*Macmillan,* 378 p., 26 pl., illus., $3. Macmillan's have published very many excellent garden books, but there has been something of a gap in the field of tropical gardening. This is now very well supplied, in a book that discusses the peculiar problems of gardening in the tropics, suggests methods for meeting them, and describes the best plant materials to use.

Science News Letter, November 21, 1936

Geology

GEOLOGY OF THE COASTAL PLAIN OF SOUTH CAROLINA—C. Wythe Cooke—*Govt. Print. Off.,* 196 p., 2 folded maps, 60c.

Science News Letter, November 21, 1936

Chemistry

MODERN PLASTICS; Oct. 1936—*Breskin & Charlton Pub. Corp.,* 332 p., $2. Under the guise of a regular issue, this journal publishes a catalog and directory number that becomes a guide to all phases of plastics. The summaries of various types of materials, from the phenolics to shellac, termed the original thermoplastic, make it a valuable reference book.

Science News Letter, November 21, 1936

Economic Geography

NATURAL RESOURCES OF THE UNITED STATES, A BASIS FOR ECONOMIC GEOGRAPHY—Richard M. Field—*Barnes & Noble,* 203 p., 75c. Another book for the College Outline Series; though intended primarily as an aid to students "boning" for examination, the information is so well chosen and so compactly presented that many others, out of college as well as in, will want it for reference.

Science News Letter, November 21, 1936

Ornithology

A NEW RACE OF THE SONG SPARROW FROM THE APPALACHIAN REGION—Alexander Wetmore — *Smithsonian Institution,* 3 p., 5c.

Science News Letter, November 21, 1936

Gardening—Botany

WILD GARDENS OF NEW ENGLAND—Walter Prichard Eaton—*W. A. Wilde Co.,* 124 p., $1.50. One who loves wildflowers in their natural state, and who also loves gardens, tells how he induces his untamed friends to come and live with him, and talks discursively of other things the while.

Science News Letter, November 21, 1936

Economics—Chemistry

RUBBER, A STORY OF GLORY AND GREED—Howard and Ralph Wolf—*Covici, Friede,* 533 p., $4.25. Comprehensive and written with verve, this is a history of rubber, the raw material, a history of rubber invention and research and a history of rubber as big business. Especially interesting to those scientifically inclined will be the part devoted to laboratory and mill, and particularly the chapter titled "Synthetic." The authors, rubber chemist and newspaper writer, tell their story with scholarly excitement. And while blood flows in the historical accounts, there is a comprehensive technical bibliography.

Science News Letter, November 21, 1936

Science

THE MARCH OF SCIENCE, A POPULAR INTRODUCTION TO THE STORY OF THE UNIVERSE AND MAN'S PLACE ON EARTH—H. Gordon Garbedian—*Covici, Friede,* 320 p., plates, $3. An easily flowing, conversational discourse of all things in heaven and earth, from conjectures on what the 200-inch telescope may show us to possibilities of the new plastic chemistry.

Science News Letter, November 21, 1936

Bacteriology

A TEXTBOOK OF BACTERIOLOGY AND ITS APPLICATIONS (rev. ed.)—Curtis M. Hilliard—*Ginn,* 339 p., illus., $3.50. A textbook that avoids the usual "premedical" approach, and handles the subject as an integral part of a well-rounded general education.

Science News Letter, November 21, 1936

General Science

WONDER WORLD OF KNOWLEDGE SERIES: WONDER WORLD OF ANIMAL LIFE, 64 p.; WONDER WORLD OF MODERN MARVELS, 64 p.; WONDER WORLD OF WHY AND HOW, 64 p.—*Wm. Collins,* 60c each. Many pictures and easy-running text make these low-priced elementary science books a good buy for any one, but especially perhaps for households with omnivorous-minded growing children. Though written in England they can be read with profit anywhere.

Science News Letter, November 21, 1936